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PERSONAL INFORMATION SYSTEMRelated Application

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This non-provisional application claims a benefit of priority of the provisional patent application Serial No. 60/181,985, titled "Medical Information System" and filed February 11, 2000, the technical disclosure of which is incorporated herein in its entirety by reference.

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Field of the Invention

This invention relates generally to an information system. More particularly, the invention relates to systems and methods for providing personal information including medical information using portable compact disc storage media, ubiquitous personal computers, and Internet browsers.

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Description of the Related Art

The advantages of storing medical information on portable devices such as smartcards have been widely publicized. Storing medical information on portable devices enables one to carry on one's person potentially life-saving medical information. Healthcare providers such as emergency medical technicians can have immediate access to personal medical data such as drug allergies in emergency situations. However, despite the well-recognizable benefits, carrying one's personal data including medical data has not become a widespread practice.

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There are several reasons for this phenomenon. For example, while portable devices such as smartcards can be used to store medical data, they require special equipment to read from and to write thereon. The special equipment is not a typical component of the ubiquitous personal computer (PC) thereby limiting the usefulness and the benefit of the smartcards. Additionally, due to limited use, the cost of the smartcards has not been reduced to the same extent as, for example, the compact disc (CD) including compact disc read only memory (CD ROM), compact disc recordable (CD R), compact disk recordable and writable (CD RW). CDs are used in many

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industries to store large amounts of data including audio, video, as well as text in a cost effective manner. Likewise, equipment to read CDs, such as a CD drive, is widely available and has become a standard component of the ubiquitous PC.

Other devices such as floppy disks pose problems as well. For example, these devices are not truly portable. They cannot be carried easily and conveniently in a wallet, for example. They require a special carrying gadget resulting in inconvenience, and thereby reducing the likelihood that they would be carried at all. Moreover, with the popularity and the reduced cost of CDs, floppy disks and the associated drives are becoming obsolete and are being replaced by the CD technology.

An additional factor contributing to the lack of widespread use of the portable devices is the method of storing, retrieving, and updating the personal data on the portable devices. Currently, the personal data that are typically stored on the portable devices are predetermined as to content. An individual patient normally does not have the option or the ability to customize the personal data that he/she desires to carry on these portable devices.

This lack of flexibility is the outcome of the industry practice and also the use of special access software programs to update the personal data. Industry practice is to generally provide a predetermined set of data on these storage devices. The purpose of the standardization is to facilitate and make implementation and maintenance of the storage devices easier. This ease, however, has come at the cost of losing flexibility. Furthermore, storing, retrieving, and updating the data on these portable devices require the use of special software programs, which are generally provided or sold to institutions and not to individual patients. Lack of access to the personal data for the individuals makes use of the portable personal data storage devices less desirable, and therefore, less widespread.

There exists a need for a system and method that resolve the shortcomings of these methods and systems.

Summary of the Invention

The present invention provides systems and methods to realize the potential benefit of portable storage devices by taking advantage of standard PCs, cost effective

optical disks, such as, for example, CDs and digital video discs (DVDs), and the Internet. As used herein, a standard PC or ubiquitous PC is defined as any personal computer including an optical disk drive capable of reading an optical disk, such as a CD or a DVD.

5 The present invention provides a personal information system comprising a subscriber computer with an optical disk drive, a portable optical disk readable by the optical disk drive, a database management server, an optical disk writer, and a subscriber interface to view the personal data stored on the portable optical disk. The optical disk writer is used to write personal data stored on the database management server onto the portable optical disk.

10 One embodiment of the present invention comprises a subscriber. A subscriber is any person or entity that subscribes to a service that provides and maintains personal data on a central database server accessible via the Internet. The personal data may include, for example, demographics, an image of the patient, insurance information, driver license number, social security number, emergency contact information, medical conditions, medical history, current medications, drug allergies, blood types, x-ray images, lab reports, a living will, a power of attorney, or conditions of admission to a medical facility. This is an example list of different types of data. It is contemplated that other types of data can be included, and the present invention is not limited to particular types of data. The personal data may be stored and viewed in a variety of formats including text, audio, images, and/or video formats. A subscriber may be an individual patient, a physician's office or a healthcare service center. The healthcare service center can include, for example, a hospital or a clinic.

15 One embodiment also comprises a subscriber system including an optical disk drive. In the case where the subscriber is an individual patient, the subscriber system would likely be a typical home PC. In the case where the subscriber is a physician's office, the subscriber system is also likely to be a PC. In the case where the subscriber is a healthcare service center such as a hospital, the subscriber system would likely be a central computer system serving one or more local area networks (LAN), each LAN serving a different department within the hospital, for example. One embodiment also 20 comprises a communication network, such as the Internet, to which the subscriber

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systems may be networked. One embodiment also includes a database management server networked to the Internet.

In one embodiment, an individual patient provides personal data to a healthcare service center. The healthcare service center then creates a portable optical disk for the patient to carry, if he/she so desires. In one embodiment, the portable optical disk comprises a credit-card sized CD ROM card. U.S. Patent No. 5, 982,736, titled TRADING CARD OPTICAL COMPACT DISC - METHOD OF USING AND FORMING SAME, which is incorporated herein in its entirety by reference, discloses a process for creating credit-card sized CD ROM cards. Accordingly, those of ordinary skill in the art will understand how to create credit-card sized CD ROM cards.

The personal data that is written onto the portable optical disk is readable and updateable by the individual patient using his/her PC with an optical disk drive and connected to the Internet. The individual patient can choose to become a subscriber after receiving his/her optical disk from the healthcare service provider. The individual patient subscriber can choose to update his/her personal data on the optical disk and can receive a new portable optical disk that includes the update. The new optical disk containing the latest update is created and delivered to the patient subscriber by the database management server.

In another embodiment, an individual patient becomes a subscriber directly with the service that maintains the personal data on the database management server rather than becoming a subscriber via the healthcare service center. The patient subscribes to the database service using his/her PC connected to the Internet. The patient enters his/her personal data using his/her PC connected to the Internet. The database management server receives the personal data, creates a portable optical disk containing the personal data provided by the individual patient and delivers the portable optical disk to the patient. As in the previous embodiment, the personal data that is written onto the portable optical disk is readable and updateable by the individual patient subscriber using his/her PC, which includes an optical disk drive. The subscriber can choose to receive an updated optical disk from the database management server at any time.

In another embodiment, an individual patient subscriber provides the personal data to a healthcare service center. The healthcare service center then creates a portable optical disk and delivers it to the patient. In this embodiment, the healthcare service center can maintain the updates to the patient's personal data within its own database. In another one embodiment, the patient updates his/her personal data by accessing the healthcare service center web site rather than by accessing the database management server web site. Additionally, the healthcare service center does not produce any optical disks. Rather, all optical disks are produced by database management server.

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Brief Description of the Drawings
These and other features will now be described with reference to the drawings summarized below. These drawings and the associated description are provided to illustrate various embodiments of the invention, and not to limit the scope of the invention. Like reference numbers represent corresponding components throughout.

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Figure 1 illustrates a personal information system in accordance with one embodiment of the present invention.

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Figure 2 illustrates a flow diagram of a process for producing portable optical disks in accordance with one embodiment of the present invention.

Figure 3 illustrates a personal information system in accordance with one embodiment of the present invention.

Figure 4 illustrates a personal information system in accordance with one embodiment of the present invention.

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Detailed Description of the Embodiments
In the following description, reference is made to the accompanying drawings, which form a part hereof, and which show, by way of illustration, specific embodiments or processes in which the invention may be practiced. Where possible, the same reference numbers are used throughout the drawings to refer to the same or like components. In some instances, numerous specific details are set forth in order to provide a thorough understanding of the present invention. The present invention,

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however, may be practiced without the specific details or with certain alternative equivalent devices and/or components and methods to those described herein. In other instances, well-known methods and devices and/or components have not been described in detail so as not to unnecessarily obscure aspects of the present invention.

5 I. System Overview

Figure 1 illustrates a personal information system 100 in accordance with one embodiment of the present invention. The system 100 comprises a patient's PC 100 including an optical disk drive 112, a physician's office PC 115 including an optical disk drive 117, a healthcare service center central computer (HSCCC) 120 including a database 122 and an optical disk writer 127, an Internet 130, and a database management server (DMS) 140 including a database 142 and an optical disk writer 144.

10 Referring to Figure 1, the patient's PC 110, the physician's office PC 115, and the healthcare service center central computer 120 may all be connected to the Internet 130 via connections 111, 116, and 121, respectively. The database management server 140 is connected to the Internet 130 via the connection 141. Additionally, the healthcare service center central computer 120 may further be connected to one or more additional local area networks (LANs) 126 connected via the connection 128.

15 Figure 2 illustrates a flow diagram of a process 200 for producing portable optical disks in accordance with one embodiment of the present invention. At a step 210, a patient provides personal data to a healthcare service center, and the healthcare service center receives the personal data at a step 210A. The patient can provide the personal data to the healthcare service center in a variety of ways. For example, the patient can provide the personal data by filling out a written form, by answering questions posed by a clerk or by electronic means. Electronic means may include, for example, downloading personal data pre-stored on the database management server 140 shown in Figure 1 or on any electronic storage devices.

20 At a step 220, the personal data provided by the patient and received by the healthcare service center is stored in a database 122 residing on the HSCCC 120. The personal data received by the healthcare service center can be entered into its database 122 using an interface to a hospital information system (HIS). HIS is an information system generally installed at various hospitals. The interface used to enter the personal

data into the database 122 is likely to be specific to the healthcare service center and, therefore, can be varied in its look and feel. It is contemplated that different interfaces can be used, and the invention is not limited to using any particular interface for the purpose of entering personal data into the HSCCC 120.

5 At a step 230, the healthcare service center can create and issue a portable optical disk, and the patient receives the portable optical disk at a step 230A. The healthcare service center can create and issue a portable optical disk to a patient any time after receiving the personal data from the patient. The portable optical disk contains the personal data and is created using the optical disk writer 127. The optical disk writer 127 can be network-connected and can be made accessible by any of the PCs connected to the LAN at the healthcare service center much like a network printer that is accessible by any of the PCs in a network. This configuration allows any PC in the network to initiate the procedure to create an optical disk.

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15 The portable optical disk that is created and issued by the healthcare service center can contain healthcare service center-specific data or can contain generic data viewable and useable by any computer system. The personal data can be stored on the optical disk in a variety of formats. In one embodiment, the data is stored in an HTML or an XML format.

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25 The portable optical disk can be made healthcare service center-specific not only as to the types of personal data that it contains but also as to the way the personal data can be viewed when played from an optical disk drive. The portable optical disk can contain, for example, a list of physicians affiliated with the specific healthcare service center. The portable optical disk can also contain, for example, a list of telephone numbers for the various departments within the specific healthcare service center. The portable optical disk can also contain promotional material specific to the healthcare service center as well as hotlinks to various web sites including its own web site, for example.

30 On the other hand, the portable optical disk can be made to contain generic data viewable and downloadable to any computer system. This configuration can provide greater flexibility and use of the optical disk. The patient can, for example, carry the portable optical disk from one healthcare service center to another without having to

5 duplicate any of the information contained therein since any center can view and download the information into its own computer system. For instance, a generic portable optical disk can be created and issued by a hospital to a patient upon admission to the hospital for a surgery. Upon discharge from the hospital, the patient can take the portable optical disk to a physician's office wherein the physician's office can load the portable optical disk into its office PC to view, and optionally to download, the personal data that was written onto the portable optical disk. The portable optical disk can contain all the details of the surgery as well as the demographics and the insurance information, for example.

10 The benefit and the convenience to the patient, the physician's office, and the hospital provided by the portable optical disks are apparent. The patient need not fill out any new forms, and need not provide any insurance or any other pertinent yet duplicative information regarding his/her medical conditions or history.

15 In addition, the physician's office benefits since data entry efforts are minimized along with the related transcription errors. The physician's office saves time in other ways also. For example, it need not obtain pertinent medical information such as lab reports or x-rays from the hospital since they can be stored on the portable optical disk and viewable from the physician's office PC. Moreover, the physician's office can provide better service to the patient as a result of having immediate access to all the pertinent medical data. The physician's office can provide quicker service and can prevent the cost and inconvenience of duplicative tests, for example.

20 The hospital benefits by the use of the portable optical disks as well. Any pertinent data such as, for example, surgery details, lab reports, x-rays, can be transferred to the physician's office via the portable optical disk rather than having to manually respond to request for such information by a physician's office. As can be clearly appreciated, the convenience to all parties increases dramatically as the number of physicians visited by the patient increases.

25 The portable optical disk use and its benefits become even more significant when the patient moves to another area of the country or when the patient is traveling. The patient need not wait the extraordinary amount of time generally required to transfer his/her medical information from his/her previous physicians' offices or from

any of the hospitals. Likewise, any pertinent data can be readily accessed from the portable optical disk that the patient is carrying during the time he/she is traveling.

Furthermore, access to the personal data on the optical disks can be controlled to provide security of the personal data contained therein. For example, the personal data may be made accessible only to authorized users who correctly enter a patient-selected password. However, since this feature may hinder emergency staff from accessing the data in an emergency, the access control feature is preferably a feature selectable by the patient on a patient-by-patient basis.

Still referring to Figure 2, at a step 235, the HSCCC 120 can format the personal data to be transferred to the DMS 140. The HSCCC 120 may or may not format the personal data prior to transferring the data to the DMS 140. The personal data to be transferred to the DMS 140 can be in a variety of formats including HL-7, ASCII, SQL, HTML, and XML formats, for example. In one embodiment, the industry standard HL-7 format is used. The HL-7 standard describes a way of formatting data to provide consistency and usability of the data by different applications. It is contemplated that different data formats can be used, and the invention is not limited to using any particular format.

At a step 240, the HSCCC 120 connects to the Internet 130 via the connection 121 and transfers the personal data to the DMS 140. The DMS 140 receives the data at a step 240A. A session to transfer the personal data from the HSCCC 120 to the DMS 140 can be initiated by the HSCCC 120 or by the DMS 140.

For example, the session to transfer the personal data from the HSCCC 120 can be initiated by the HSCCC 120 and can occur in real-time or in a batch mode on a pre-arranged schedule. In addition, the data transfer can occur in any mode that will permit the personal data to be transferred to the DMS 140. The HSCCC 120 can, for example, dial into the DMS 140 and transfer the personal data. The HSCCC 120 can also, for example, broadcast packets of the personal data with the appropriate destination address targeted to the DMS 140.

The session to transfer the personal data from the HSCCC 120 to the DMS 140 can also be initiated by the DMS 140. As in the case where the data transfer is initiated by the HSCCC 120, the data transfer can occur in real-time or in a batch mode and can

occur in any mode that will permit the personal data to be transferred to the DMS 140. The DMS 140 can, for example, dial into the HSCCC 120, retrieve the awaiting personal data, and transfer it. The DMS 140 can also, for example, remain in a polling mode and extract the data intended for the DMS 140.

Furthermore, the transfer of personal data preferably occurs in a secure mode in compliance with various security standards including the RSA 5 Secure Socket Layer (SSL) protocol. The RSA 5 SSL protocol uses 128 bit encryption on all information sent to and from the DMS 140. In addition, the data stored in the database 142 can be encrypted using the Desktop Encryption Standards (DES), DES III or Blowfish. It is contemplated that different encryption methods can be used, and the invention is not limited to using any particular encryption method.

10 The security of data is also preferably maintained in compliance with the Health Information Portability and Accountability Act (HIPAA). The HIPAA legislation was passed to mandate a certain level of security to protect the health and medical information that have become widely available in electronic formats transmittable over public networks such as the Internet.

15 At a step 250, the patient can play the portable optical disk on his/her PC to review the information contained therein. In one preferred embodiment, the optical disk can auto-play into an Internet web browser such as, for example, Microsoft Internet Explorer or the Netscape Navigator. The optical disk can auto-play into the web browser and display the personal data stored therein. In addition, the optical disk can contain other navigational tools such as hotlinks to various web sites including the web site of the healthcare service center that issued the optical disk or the database management server web site. By using the hotlinks provided on the optical disk, the patient can, for example, conveniently upload updates of the personal data to the DMS 140 at a step 255. The patient can also pre-register for a hospital admission, for example, using the hotlinks provided on the optical disk.

20 The access to the personal data stored in the database 142 can be controlled by various methods to provide data security. For example, Verisign Certificate Authentication can be used to verify the patient and the information being transmitted to and from the patient's PC 110. A patient-specific identification number such as a pre-

5 assigned medical record number and/or a social security number may be used to access the patient's records. Other technologies such as embedding and verifying the fingerprints on the optical disk may be incorporated to provide significant levels of patient authentication. It is contemplated that different methods can be used to control access to the personal data stored in the database 142, and the invention is not limited to using any particular method.

10 Still referring to Figure 2, at a step 245, the database management server 140 can process the personal data that it receives from the healthcare service center central computer 120 in preparation for storage into its database 142. The DMS 140 can, for example, parse the personal data that it receives and store the data as an HTML or an XML document into the database 142 if not already in the HTML or the XML format. In a preferred embodiment, the DMS 140 stores the personal data as an HTML or an XML document into the database 142.

15 At a step 260, the database management server 140 can create a new optical disk containing the updates sent by the patient using the optical disk writer 144. The new optical disk is delivered and received by the patient at a step 260A. As in the case where the healthcare service center creates the optical disk, the optical disk writer 144 can be network-connected to enable the procedure to initiate creating the optical disk from any PC on the Database Management Server network. The optical disk creation process can also be fully automated using robotics technology. Robotics technology can be implemented with either of the optical disk writers 127 or 144 to automate the optical disk writing process, the labeling process, the packaging process, and the shipment process, for example.

20 The patient can repeat the steps 250 and 255 at any time to update his/her personal data. The patient may, but is not required to, request a new optical disk that reflects the latest updates that he/she provides to the DMS 140. Furthermore, the healthcare service center central computer 120 may at any time connect to the database management server 140 to download the latest personal data stored on the DMS 140.

25 In one embodiment, the personal data is provided by the patient directly to the database management server 140 rather than first providing the data to a healthcare

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service center which in turn forwards the data to the DMS 140. The DMS 140 receives the personal data from the patient, creates, and delivers an optical disk to the patient. Referring to Figure 2, this embodiment could be depicted by deleting the Healthcare Service Center column and starting the process from the step 255.

5 At the step 255, the patient can send new and/or changed personal data to the DMS 140. The DMS 140 receives the sent data at the step 240A, processes and stores the personal data at the step 245. At the step 260, the DMS can create and send a new optical disk to the patient who receives the new optical disk at the step 260A. The patient can repeat this process at any time to forward new and/or changes to the personal data that is stored on the DMS 140.

10 In another embodiment, the personal data is completely contained within the healthcare service center and all related processing of the data occurs within the healthcare service center. This embodiment provides increased data security since no personal data is transferred outside the healthcare service center central computer 120.

15 Figure 3 illustrates a personal information system 300 in accordance with one embodiment of the present invention. The system 300 comprises a healthcare service center central computer 120 including a database 122, an internal network backbone 128, a network-connected optical disk writer 127, a kiosk 330, and various department PCs as exemplified by the Admissions department PC 326A, the Billing department PC 326B, the Radiology department PC 326C, and the Lab #1 PC 326D. Each of the 20 department PCs contain an optical disk drive. Moreover, any of these departments, as well as any other departments within the healthcare service center, can be served by its own LAN. For example, the Admissions department can be served by a separate LAN 25 that consists of a number of PCs including the PCs installed at each Admissions registration desk as well as the PCs in the various cubicles and the offices within the Admissions department. The Admissions department LAN can, in turn, be connected to the healthcare service center's internal network backbone via various bridges and/or routers, as appropriate.

30 Referring to Figure 2, the process for creating portable optical disks used in connection with the system 300 could be depicted by deleting the Database

Management Server column. As in the process 200, a patient provides the personal data to the healthcare service center, which stores the data in the database 122 of its healthcare service center central computer 120. The healthcare service center then creates and issues an optical disk to the patient.

5 In contrast to the process 200, the patient using the system 300 cannot update the personal data by connecting to the database management server 140 via the Internet since the central database of personal data is maintained at the database 122 to increase data security. However, the healthcare service center may provide a kiosk 330 that includes a user interface. The patient can use the interface to enter updates to the personal data that is stored on the database 122. The user interface provided at the kiosks can be displayed in a variety of formats. The healthcare service center can setup 10 a number of kiosks at various locations throughout the healthcare service center for the patients' use and convenience. The kiosks may also include an optical disk drive to allow the patient to view the information stored on the optical disk as well.

15 As in the process 200, the healthcare service center will create and issue the initial optical disk, but the healthcare service center will also create and issue new optical disks that reflect any additions or changes to the personal data.

20 In another embodiment, the patient updates his/her personal data by accessing the healthcare service center web site rather than by accessing the database management server 140. Additionally, the healthcare service center does not produce any optical disks and all optical disks are produced by an offsite database management server.

25 Figure 4 illustrates a personal information system 400 in accordance with one embodiment of the present invention. The system 400 comprises a patient's PC 110 including an optical disk drive 112 and connected to the Internet 130 via the connection 111. The system 400 further comprises a healthcare service center central computer 120 including a database 122 and connected to the Internet 130 via the connection 121, an internal network backbone 128, one or more LANs 126, a database management server 140 including a database 142 and a network-connected optical disk writer 144 and connected to the Internet 130 via the connection 141, and a healthcare service center web site server (HSCWSS) 420 including a database 422 and connected to the Internet 130 via a connection 421.

In the system 400, the patient provides the personal data to the healthcare service center which is in turn stored in the database 122. The database management server 140 thereafter either receives or retrieves the personal data stored in the database 122, as in the process 200. The DMS 140 then creates and delivers an optical disk to the patient. In contrast to the process 200, the patient receives his/her initial card from the database management server rather than the healthcare service center.

Subsequent to the receipt of his/her initial optical disk, the patient can add and/or update his/her personal data by logging onto the healthcare service center web site server 420. Any such additions and/or updates to the personal data are received and/or retrieved by the DMS 140 either in a real-time mode or in a batch mode from the healthcare service center web site server 420 via the Internet 130. The DMS 140 can create and deliver an updated optical disk to the patient if the patient so requests. The healthcare service center is not engaged in producing optical disks in the system 400 illustrated in Figure 4.

The system 400 increases the healthcare service center's ability to build patient loyalty and to control patient information. By serving as the portal through which the patient maintains his/her information, the healthcare service center has the opportunity to expose the patient to various marketing promotions as well as maintaining a visible presence in the patient's mind. In addition, the system 400 allows the healthcare service center to maintain and access the latest data regarding on any of its patients with no additional effort on its part. Any additions and/or changes to the patient's personal data are made by the patient to the database 422, to which the healthcare service center has full access.

Furthermore, the healthcare service center can implement various schemes to control the access and the types of data that can be changed by the patient. Various access control schemes, as discussed in connection with the process 200, may be implemented to provide security. Additionally, the healthcare service center can control the types of data that may be changed. For example, the healthcare service center may prevent certain fields, such as the field designating the blood type, from being changed. In all of the embodiments described above, the patient has flexibility to choose what information he/she decides to store and carry on the optical disk. For example,

one individual may only want his/her emergency information such as drug allergies, blood type, emergency contact information, and current medical conditions. On the other hand, another individual may desire to carry a more comprehensive optical disk containing, for example, complete demographics, a power of attorney, insurance data, a video of his/her will, etc. in variety of formats including text, audio, images, and video. Still another individual may desire to store various family data and vaccination data to leave with a babysitter. Yet another individual may desire to store related information such as parental consent forms, emergency contact information to leave at a child's school. Yet another individual may store information related to skilled nursing care facility. Since the optical disk technology offers large data storage capacity in these cards, the types and the amount of information to be stored thereon is limited only by the imagination and the creativity of the individual.

Although the invention has been described in terms of certain preferred embodiments, other embodiments that will be apparent to those of ordinary skill in the art, including embodiments which do not provide all of the features and advantages set forth herein, are also within the scope of this invention. Accordingly, the scope of the invention is defined by the claims that follow.

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